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**Two Experiments on the Difference between
Willingness to Pay and Willingness to Accept**

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Two Experiments on the Difference Between Willingness to Pay and Willingness to Accept

Abstract

"Willingness to pay" (WTP) and "willingness to accept" (WTA) measures of welfare change typically differ substantially when elicited from surveys or market transactions. This finding is contrary to the expectations of standard economic theory which suggests that these two measures should be relatively similar in magnitude. Several possible explanations for this anomaly are reviewed. This study focuses on one explanation, that the availability of substitutes for the good being evaluated affects the difference between the two measures. Two experiments are conducted. First, a contingent valuation survey valuing movie tickets is administered to classes of university students. Second, the results of a survey of big game hunters are examined for evidence supporting various hypotheses on the nature of the divergence between WTP and WTA. It is concluded that there is little, if any, evidence of the availability of substitutes affecting WTP-WTA differences.

Two Experiments on the Difference Between Willingness to Pay and Willingness to Accept

Introduction

Economic analysis is often concerned with the estimation of "values" or welfare measures for various goods and services. In attempting to derive empirical estimates of welfare measures individuals may be asked to state the maximum they would be willing to pay for a particular good or service. Alternately, they could be asked to state the minimum amount they would require in compensation if the good or service was removed. Most economists would agree that these welfare measures, referred to as Willingness to Pay (WTP) and Willingness to Accept (WTA) respectively, should be similar in magnitude for most goods. However, repeated experimentation has shown that WTP and WTA measures are vastly different. Experimentation has been carried out using hypothetical questions, actual market transactions, goods which are known to the consumer and priced in a market, and goods which are not traditionally priced in a market (see for example; Knetsch and Sinden 1984; Knetsch 1989; Bishop and Heberlein 1979; Coursey, *et al.* 1987). WTA values of three to five times WTP values have been typically found in empirical work eliciting both measures (Cummings *et al.* 1986).

While the difference between WTP and WTA in empirical studies is well documented, there is still considerable theoretical banter regarding the explanation for this observed difference. The explanations range from those which accept traditional economic theory and suggest difficulties in survey or elicitation design, to explanations which reject existing economic theory and provide alternate behavioral models which explain such differences (eg. Kahneman and Tversky, 1979).

A number of studies have replicated the difference between WTP and WTA. However, seldom has there been an empirical attempt to explain this divergence. In this paper we also replicate the finding of the difference between WTP and WTA for two hypothetical goods, one market good and one nonmarket good. However, we also attempt to test hypotheses which could explain the divergence of the two measures. In particular we test an extension of the approaches which attempt to explain the difference on economic grounds, the substitution hypothesis as presented by Hanemann (1989). Hanemann suggests that the difference between WTP and WTA depends not only on an income effect but also on a measure of the substitutability between the goods being valued and other goods in the utility function.

An additional aspect of this study is our use of the WTP and WTA measures from the *same individuals*. In many studies of this kind the WTP and WTA responses are derived from different individuals, thereby precluding an analysis of the difference between these measures as a function of *individual specific* attributes. We elicit both WTA and WTP from each individual and attempt to explain the difference.

We now turn to a more detailed discussion of the various theories on the divergence between WTP and WTA. The paper continues with an explanation of the two experiments, a hypothetical valuation exercise involving the sale of tickets to a local repertory theater and a valuation exercise involving days of big game hunting. The third section of the paper presents the results of the valuation questions and the tests of the substitution hypothesis as a means of explaining the WTP-WTA difference. The final section contains a discussion of the results.

Measures of Welfare

Hicks (1943) suggested four measures of welfare which are derived from a Hicksian demand curve (holding utility constant). Compensating variation (CV) "is the amount of income which must be taken away from a consumer (possibly negative) after a price and/or income change to restore the consumer's original welfare level" (Just *et al.* 1982, p.85). Equivalent variation (EV) "is the amount of income that must be given to a consumer (again possibly negative) in lieu of price and income changes to leave the consumer as well off as with the change" (Just *et al.* 1982, p.85).

One measure of EV is the consumer's WTP to avoid an adverse (in relation to the consumer) welfare change, or alternatively, WTA in the case of a precluded positive welfare change. CV is the consumer's WTA in order to accept a negative change, or alternatively, WTP to have a positive welfare change occur. When considering a given policy change then, any one consumer could have two different welfare measures. Thus measures of welfare could potentially be voiced either in the WTP form or the WTA form.

The Relationship Between WTP and WTA

An assumption of utility theory is that an individual's valuation of equivalent losses (i.e. WTA) and gains (i.e. WTP) should be almost equal. This position was supported by Willig's (1976) theoretical work involving these welfare measures. Willig argued that for price changes, the EV (WTP) and CV (WTA) measures should be, in practice, very close in value. The two measures would differ in that WTA would involve an additional income effect. In most applications, however, this income effect is assumed to be very small (Freeman 1979, Knetsch and Sinden 1984).

Further theoretical work extended Willig's near equivalence result to general quantity changes. Randall and Stoll (1980) found that for general quantity changes, measures of WTP and WTA should be within five percent of each other. Randall and Stoll found that the measures should be quite close in most cases of quantity changes, however, this finding did not carry over to some cases of discrete quantity changes.

The near equivalence predicted by standard economic theory has been contrary to the results of most empirical work trying to elicit WTP and WTA. Most applied research in this area has used the Contingent Valuation Method (CVM), a survey based method of eliciting welfare measures (see Mitchell and Carson, 1989). Hammack and Brown's (1974) study of waterfowl benefits found WTA to be over four times WTP. Bishop and Heberlein (1979) received WTA values of five times WTP. Similar results have been found in subsequent studies (see Brookshire *et al.* 1980, Rowe *et al.* 1980, Knetsch and Sinden 1984). In general, "derived measures of WTA are consistently larger-on the order of three to five times larger-than measures of WTP" (Cummings *et al.* 1986, p.35).

The possible explanations for the anomaly between standard economic theory and empirical results using the CVM can be categorized into three groups. The first group includes explanations supporting standard theory, and claiming that the difference is a function of the empirical procedures involved in eliciting WTP and WTA. The second group includes explanations from psychological research involving individual choice behavior. The third group includes alternatives from within economics which might account for an inherent difference between WTP and WTA.

Explanations From Standard Economic Theory

Explanations for the empirically observed large difference between WTP and WTA have, from the start, been those which tended to support standard economic theory. In this category are explanations of the WTP-WTA difference relating to problems with the CVM, or hypothetical testing procedures, in a general sense, as well as those relating to either of the measures.

Problems with the CVM

One explanation for the WTP-WTA difference appeals to problems in the data collection, interviewing technique, or questionnaire design used in administering the CVM (Brookshire *et al.* 1980, Dwyer and Bowes 1978). In particular, respondents of CVM surveys may not have enough incentive to give truthful answers.

"Biases" in the CVM because of its hypothetical nature are frequently used as explanations of the large WTP-WTA differences. Strategic, information, vehicle, and starting point bias are often included in the list of biases (Schulze *et al.* 1981). While the "biases" within the CVM may account for at least some of this apparent inconsistency, empirical work has not always confirmed this hypothesis. Evidence on strategic bias has tended to show it to be of little importance in those studies testing for it (Rowe *et al.* 1980, Brookshire *et al.* 1980). In addition, the evidence for the other forms of possible bias has been inconclusive (see Schulze *et al.* 1981, Thayer 1981 for detailed discussions of bias in the CVM). While biases may account for some of the traditionally observed WTP-WTA difference, it would seem necessary to seek out other explanations for the large differences found in practice.

Most of the explanations for the difference between WTP and WTA mentioned above have actually been attacks on the hypothetical nature of the questions used to elicit these values. However, the difference remains in simulated markets for a number of goods which are familiar to the consumer. In a number of studies (Knetsch 1989; Kahneman, Knetsch and Thaler 1990; Knetsch and Sinden 1984) the WTP and WTA measures were elicited using actual commodities and money. The results were similar to those from hypothetical surveys. The difference persists even when consumers have the good in their hands (no uncertainty about the nature of the good) or when they are valuing goods which they are used to buying and perhaps selling in a market (no rejection of the property right). This area of research suggests that criticisms based on the hypothetical nature of the survey questions are not well founded.

Problems with the WTA measure

Another group of explanations for the WTA-WTP difference suggests that the WTA measure is faulty (eg. part I of Cummings *et al.* 1986). This position originates from the tendency of WTP to perform better than WTA in comparison studies. WTP values tend to correspond more closely to estimates from other methods of nonmarket valuation (i.e. hedonic methods, travel cost), or to simulated market data (see Cummings *et al.* 1986). Two possible explanations for the rejection of WTA have been proposed in the literature. The first is that consumers make cautious valuations (Hoehn and Randall, 1987). Hoehn and Randall's cautious consumer hypothesis asserts that consumers make cautious valuations of goods when they are relatively unfamiliar with the good in question, when they lack the time to completely optimize their decision, and/or when they are risk averse. Thus, by being cautious consumers, individuals will tend to overstate their WTA and understate their WTP. This result would perhaps then explain why WTP and WTA values are observed to differ by such large amounts.

The second reason for rejecting the WTA response is the notion that many respondents reject the property right implied by WTA-type questions (i.e. they find the property right to be either perverse or implausible). This assertion stems from two tendencies: the occurrence of many more refusals to answer with WTA questions than with WTP questions, and the greater percentage of WTA answers which are "outrageously" high (Mitchell and Carson 1989).

Explanations from the Psychology-Economics Literature

A second group of explanations for the observed WTP-WTA differences is found in the psychology-economics literature. The general view in this literature is that WTP-WTA differences are real phenomena and not simply functions of the testing regime and other related problems. This view originated from empirical work related to choice behavior (Kahneman and Tversky 1979, Kahneman, Knetsch, and Thaler 1986). This category of explanations includes Prospect Theory (Kahneman and Tversky 1979) and a variety of other theories such as "cognitive dissonance".

Prospect theory

Kahneman and Tversky's prospect theory involves the often observed condition that individuals may have different values for losses and gains of the same magnitude. "This would suggest, for example, separate indifference maps to illustrate acquisition and disposal decisions" (Knetsch and Sinden 1984, p.519-520). WTP and WTA measures would be different, as they would be based on different value functions.

Prospect theory represents an interesting approach to the WTP-WTA difference. The additional value attached to possession may be considered an "instant endowment effect" (Kahneman, Knetsch and Thaler, 1990). The ramifications of such a value function for economic theory are quite widespread. For example, Kahneman, Knetsch and Thaler (1990) point out that such behavior undermines the potential for preferences that are independent of entitlements, a common theme in economic analysis.

Cognitive Dissonance

It has been suggested (Cummings et al. 1986) that the theory of cognitive dissonance (Festinger 1957, 1964) may provide an explanation for large differences between WTP and WTA. Cognitive dissonance exists when a person holds two inconsistent, or rather, contradictory ideas (see Akerlof and Dickens 1982, for a treatment of cognitive dissonance in an economic framework). If WTP represents a buying price of a recreation site visit and WTA a selling price for this quasi public good, an individual may view the buying price and the selling price differently. The buying price may be viewed as the site's value relative to other related sites. The selling price, however, may reflect attitudes of the consumer as a "member of society" rather than a budget constrained consumer. The different views reflect two opinions (cognitions in Festinger's terminology) which contradict economic theories.

Fairness Theories

An alternative rationale for the divergence of these two measures may be that the WTA measure evokes some measure of additional compensation on fairness grounds. Elicitation of "fair" compensation responses has been performed by Kahneman, Knetsch and Thaler (1986). In their study they find that fairness explains a number of "anomalies" in economic behavior.

Regret Theory

Another proposal from the psychology-economics literature to help explain the WTP-WTA difference is regret theory (Loomes and Sugden 1982). Regret theory suggests that the choice of an action is based on the utility derived from the choice, the utility of the choice not made, and the uncertainty associated with the outcomes of the choices. If a choice is not made and that choice turns out to be beneficial, regret occurs. If a choice is made and it is better than all alternative when uncertainty is resolved, rejoicing occurs. Individuals could view WTP and WTA as different contexts within which to view regret and rejoicing.

Summary

There exist a number of theories which attempt to "explain" the difference between WTP and WTA. Some hold to economic arguments and criticize the CVM approach while others suggest that the phenomenon is a true expression of valuation. Fisher, McClelland and Schulze (1988) suggest that the difference is a function of both strategic behavior and "loss aversion", although they provide no rigorous empirical support for this thesis. In the following section we provide one additional hypothesis for the difference, the Hanemann substitute good hypothesis.

Alternative Economic Theories: The Substitute Hypothesis

In response to the variety of theories which explain the WTP-WTA difference on non-economic (or non-traditional economic) grounds, Hanemann proposed that the difference between WTP and WTA may be due to the existence of lack of substitutes for the commodity being valued. Hanemann (1989), in a reformulation of Randall and Stoll's (1980) theoretical work involving consumer surplus measures resulting from quantity changes, argues that "for quantity changes there is no presumption that WTP and WTA must be close in value and unlike price changes, the difference between WTP and WTA depends not only on a income effect but also on a substitution effect" (Hanemann 1989, p.2). Hanemann shows that when there is a perfect substitute for the good being valued, WTP and WTA will be equal in the absence of any income effect. Conversely, when there are zero substitutes for the good, WTP and WTA can be vastly different. Thus, WTP and WTA measures depend on a parameter reflecting the degree of substitutability of the good being valued. In this way, Hanemann demonstrates that Randall and Stoll's "bounds are consistent with substantial differences between WTP and WTA" (Hanemann 1989, p.3). Hanemann's theory attempts to deal with the observed WTP-WTA difference through a line of inquiry well rooted in economics (i.e. substitute relationships). While this does not give Hanemann's theory *a priori* superiority over the competing theories, it enables us to test his theory within an economic methodology.

Experimental Design

In order to examine the effect of the availability of substitutes on the difference between WTP and WTA two sets of data were examined. The first set of data was derived from an experiment designed to test this phenomenon using a contingent valuation survey administered to classes of undergraduate students. The second set of data was obtained from a survey of recreational big game hunters. In this survey the hunters were asked for their WTP and WTA for the recreational activity. Other information, including activity levels,

hunting satisfaction rating scales, biographical data, and expenditures were also collected. The experimental design procedures are described below. The first experiment, involving the undergraduate students, is referred to as "The Movie Ticket Experiment" and the second experiment is called "The Big Game Hunting Survey".

The Movie Ticket Experiment

The good chosen for the valuation experiment had to be one which could fill the following requirements: (1) The good would have to have differing levels of substitutability across individuals, and (2) some measure of this substitutability would have to be represented by a variable which could be readily obtained in a questionnaire. The valuation task was accomplished using the contingent valuation method (CVM). Although the CVM is often designed to measure benefits related to nonmarket goods (i.e. environmental services), issues in the CVM can be investigated using market goods. In this study we chose to examine a market good as potential problems related to people's ability to place a value on nonmarket goods (i.e. their unfamiliarity with valuing them) can be avoided. The hypothetical "bias" problem discussed above can hopefully be minimized.

The good chosen was a movie ticket to a single showing of a feature film at a local repertory theater. Movie tickets were chosen on the grounds that they are familiar to the survey respondents (undergraduate students), they are relatively small as a portion of the respondent's budget and they possess several substitutes. Watching a movie on a videocassette recorder (VCR) could be a substitute for going to watch a movie at a theater. In addition, the degree that watching a movie on a VCR acts as a substitute could vary according to whether an individual owns a VCR, as well as according to how (s)he may feel about movie theater experiences. The one time showing at the repertory theater was chosen in order to avoid temporal substitution, that is, to eliminate opportunities to view the movie on alternate dates or at alternate sites within the local area. The repertory theater also provides a rather unique experience which not all movie watchers seem to prefer.

Finally, a specific movie feature was chosen to heighten the realism of the survey. A feature had to be chosen which appeared to have a wide appeal with the university students being questioned. The "1988 Cannes Commercials" were chosen, as they had been extremely popular locally (see appendix I for the description given to the subjects).

The WTP and WTA questions

The WTP question is an open-ended valuation of a one-time chance at a movie ticket, on a feature shown only once (the date and time specified in the questionnaire description). The subjects were notified that tickets were only available on one day in advance, during a one hour time period (again with dates and time specified in the description, see appendix I for the complete question). Similarly, the WTA question is a valuation of what would be needed in compensation for a ticket to the same showing which was already owned. In this case, the ticket had been only available in advance (on a day that had already passed).

Defining possible substitute relationships

The substitute chosen for seeing a feature at a movie theater was seeing the same feature on a VCR (the feature was said to be available on video at most video rental stores). The degree to which this was a

substitute was determined on the basis of the respondent's access to a VCR, their attitude towards VCR versus big screen theater experiences and their attitudes toward theater use (see questions 3, 4, 5, 8, and 9 in appendix I).

The remaining questions deal with traditional socioeconomic variables which may affect individual valuations. The respondents were asked several socioeconomic questions eliciting their age, sex, university faculty enrolled in, and disposable income.

The questionnaire and issues of bias

First, by choosing a relatively familiar market good, we have perhaps avoided some of issues related to the hypothetical component of CVM surveys. While it still is not an actual transaction, the attempt was made to make it as realistic as possible (i.e. with specified dates, times, and feature). Second, in relation to strategic behavior, the good and scenario chosen are not likely to produce strong strategic sentiments. Third, because the good chosen is a relatively familiar one to most people, there should not be a lack of information. Fourth, the good chosen is one for which people typically pay entrance fees to get access. The payment vehicle chosen should not present a large problem, as respondents are familiar with the concept of having to pay in currency for movie tickets. Finally, as we are using single, open-ended valuation questions, starting point bias is not a factor. Thus, with the choice of a relatively familiar market good for this study, the potential for biases should be limited.

Issues in the implementation of the questionnaire

The questionnaire was administered to 2 pretest groups with 14 and 40 students respectively. For most of the questions, the first version of the questionnaire differs very little, if at all, from the final version. The questionnaire was administered to three classes of 29, 22, and 117 students respectively. The combined sample was 168. The class of 29 was a summer session course of introductory microeconomics, the class of 22 a summer session course of intermediate microeconomics, while the class of 117 was a fall session course of introductory physiology.

Quantitative Analysis

Descriptive statistics were calculated for the test variables (see table 1). The mean WTP was \$4.76, its standard deviation (SD) was 3.30. The mean WTA was \$9.30, its SD was 8.60. Thus, the mean difference between the two measures ("Difference") was \$4.55 and its SD was 8.29. Of our respondents, 63 had equal WTP and WTA values (i.e. difference equal to 0), and 93 had WTA values greater than corresponding WTP values (difference greater than 0). There were 7 respondents with WTP greater than WTA (difference less than 0). A test of means reported in table 2 shows the two measure's means to be significantly different at the 1% level using a two-tailed t-test.

Statistics on the other biographical and attitudinal questions elicited are presented in table 1. The values for categorical variables can be obtained from the survey in appendix I.

Note that the summary statistics for the variable "difference" indicate that some of the respondents had WTP values higher than WTA values. Such responses have not been found in this literature in previous studies. In most of these cases casual investigation showed that the respondent's were behaving strategically in

some form or they were not committed to the task. The quality of their responses to various items on the survey were "questionable". Therefore, a separate category of statistics is presented for a truncated sample; a sample with these 4 individuals removed.

As in most CVM studies, some WTA bids were extremely high and seemed to reflect a misapplication of the survey technique. In an effort to preclude outliers from the analysis, WTA values larger than two standard deviations from the mean were eliminated (i.e. truncation at WTA values greater than approximately 26). This resulted in 5 responses being removed from the original sample. The treatment of high WTA values or outliers is a somewhat problematic component of CVM survey results. These results may be real attitudes (implying including them in statistical work), or they may represent "noise" resulting from strategic behavior, or protests to the property right implied by WTA questions. As the good being valued is a movie ticket, it is unlikely that huge WTA values represent actual attitudes. In addition, most of the extremely high WTA responses eliminated from analysis were accompanied by extremely low WTP values (i.e. WTP = \$0.50 and WTA = \$50.00). These types of responses were thought to be a result of strategic behavior or some other misapplication of the survey technique. These responses were also removed from the analysis and the resulting data were grouped into the set of "truncated" results. Table 2 indicates that the mean WTP and mean WTA measures for the truncated sample are also significantly different at a 99% significance level.

Regression analysis

Regression equations were estimated with difference as the dependent variable in an attempt to directly examine the WTP-WTA divergence. A variety of regressions were estimated using many different specifications and functional forms.¹ In general, the potential substitute variables were not found to be significant in explaining any observed difference between the two welfare measures. Neither the "VCR own" nor the "big screen" variables were significant in any regression estimates (see table 3). It is interesting to note that the measure of income chosen was not a significant determinant of the difference between WTA and WTP. The gender variable was significant at the 5% level using a linear functional form in two specifications (see table 3). The coefficient was positive, implying that the difference between WTA and WTP is higher on average for males than for females.

"Truncated" regressions (excluding outliers and negative difference values) using difference as the dependent variable generally conformed to the results of the non-truncated sample. The "extra income", and "VCR own" variables were not significant (see table 3). With the truncated sample, the "big screen" variable was found to be significant at the 5% level using a semi-log form², though it was not significant in a linear form (see table 3). The coefficient of the "big screen" variable was positive, implying that the difference between WTA and WTP increased as the relative importance of big screen size decreased. This is contrary to expectations as respondents who felt that screen size was not important would be assumed to have watching the same feature on a VCR as a relatively close substitute (thereby not requiring extra compensation due to any uniqueness in screen size in watching the feature at a movie theater).

The paucity of significant relationships is quite evident. While the "big screen" variable was significant in one instance, its coefficient was positive, which was contrary to the expectations of substitute effects. The lack of significance of the income variable was also notable, however this may be due to the limited variation in income over the sample. The gender variable was significant in most difference regression estimates.

The results in this experiment provide little support for the hypothesis that the degree of substitution is a determinant of the difference between WTP and WTA. We now turn to the second experiment which uses recreational hunting survey data.

The Hunting Survey Experiment

The second experiment involves a CVM survey of recreational hunters in Alberta (Adamowicz 1983). This study elicited information on the socioeconomic profiles of hunters and provided estimates of welfare measures for the value of hunting in Alberta.

The questionnaire was designed to study the social and economic aspects of big-game hunting in Alberta. The questionnaire was sent to samples of licensed hunters in Alberta. The data involved in this study are from a sample of holders of Big Horn Sheep hunting licenses. The questionnaire was sent by mail to a sample of 1000 holders of sheep hunting licenses. Of the 1000 sampled, 621 returned usable questionnaires. 243 responses useful for this analysis were obtained.

The WTP question asked for the value (over and above expenses) of a day of hunting. A range of dollar values were listed in ascending order from \$5 to \$100. The respondent was to circle the worth of a day of hunting to them. If their WTP was above or different from the range, they were to specify the amount. The WTA question asked how much money a respondent would have to be paid not to hunt in Alberta for one year. A range of dollar values again were listed, this time ranging from \$0 to \$900. Similarly, a respondent was to circle their WTA amount, or specify it, if it was higher (or different) than the values listed.

The WTP question asked for a valuation of a day of hunting while the WTA question asked for the amount of compensation required for giving up hunting for a year. In this state, the two measures are not comparable. It was necessary, therefore, to transform the measures into valuations of a day of hunting. In response to this problem, the compensation measure was altered in the following two ways. First, the compensation value was divided by the total number of hunting days taken by that person in the previous year to form the average WTA (denoted AWTA). The second method of transformation involved computing a marginal value for WTA. This was achieved by estimating a "bid function" by regressing total compensation on the number of hunting days and income.³

A variety of variables were hypothesized to represent varying degrees of substitute availability for the hunters. Subjects were asked to rank a list of reasons for hunting in order of importance. The reasons are: for meat, for a trophy, for outdoor enjoyment, for companionship, for exercise, and any other reason, which was to be specified by the respondent. A respondent's primary reason for going hunting may provide evidence of relative substitutability. For example, reasons for hunting such as "exercise" and "companionship", have more substitutes than hunting for "a trophy".

Conceptually the relative substitutability of hunting may also be related to a respondent's dedication or intensity in the hunting activity. The variables which may indicate this intensity are outlined include: (1) "CAPCOST", the amount of hunting capital purchased (i.e. hunting equipment), (2) "VEXP", the variable expenditures on hunting trips (lodging, transportation, food, and other variable costs), (3) "PEREXP", the variable costs as a proportion of income, (4) "AVGDIST", the average distance travelled per hunting trip, and (5) "TOTLIC", the total number of hunting licenses held by a respondent. Descriptive statistics for these variables are presented in table 4.

Descriptive statistics for the valuation measures are also presented in table 4. In this survey, the mean AWTa measure was just over two times the mean WTP measure. The mean MWTa however, is just over 25% larger than the WTP measure. It is worth noting that 63.4% of respondents had AWTa greater than WTP, 6% had AWTa equal to WTP, and 30.6% had WTP greater than AWTa. With the MWTa measure, 73.4% had MWTa greater than WTP and 26.6% had WTP greater than MWTa. The prevalence of these negative difference values, as noted above, represents surprising behavior, unexpected by standard theory. A test of means shows the MWTa and AWTa are both significantly different from the WTP measure at a one percent level.⁴

DIFF1 (AWTa-WTP) Regression Results

The first set of relationships estimated were regressions examining the degree of explanation of the AWTa-WTP difference, DIFF1. The total number of licenses held (TOTLIC) was significant using both the linear (10%) and semi-log (5%) forms (see table 5). The coefficient is positive in all cases, which concurs with the notion that the higher the number of licences the more difficult it will be to find a substitute for hunting for the individual.

Of the variables expressing hunting intensity through hunting related expenditures, only the amount of variable expenditures is significant. It is significant at the 10% level using both linear and semi-log forms (see table 5). However, the coefficient is negative. The initial hypothesis was that those who spent larger amounts on variable expenses would have a higher relative intensity towards hunting, hence fewer substitute opportunities (i.e. higher difference).

Of the ranked reasons for hunting, only hunting for meat was found to be significant (see table 5). It is significant at the 1% level using both linear and semi-log forms. The coefficient is positive, which implies that difference increases as hunting for meat becomes a less important reason for hunting (as the ranking scale goes from 1-highest to 6-lowest). A possible explanation for this relationship is that people who hunt primarily for meat will have the ability to partially substitute for wild meat with other purchased meats. Neither the average distance travelled per hunting trip or income were significant in any of the regressions.

DIFF2 (MWTa-WTP) Regression Results

The DIFF2 regressions, generally, had fewer significant relationships. Of those variables which were significant in DIFF1 regressions, the amount of hunting related variable expenditures ("VEXP" in table 6) is significant only using a semi-log form at the 1% level. Similarly, hunting for meat ("Meat") is significant in only one instance using a linear form (at a 10% level). The total number of hunting licenses held is not significant in DIFF2 regressions.

The results of the DIFF2 regression estimates do not substantiate the results obtained in the DIFF1 regressions. As such, the results of the difference regressions involving the hunting survey generally concur with those of the movie ticket survey in finding little support for the substitute hypothesis.⁵ While the total number of licenses held ("TOTLIC") was significant with the expected sign in DIFF1 regressions, this result was not supported in DIFF2 regressions. The variables which were thought to indicate the relative substitute opportunities were not generally found to be significant.

Summary and Conclusions

The purpose of this study was to investigate an apparent impasse between empirical results and standard economic theory. More specifically, the study was to investigate the large differences found in contingent valuation method (CVM) surveys, between willingness to pay (WTP) and willingness to accept (WTA) measures of welfare change. These empirical results were in contrast to theoretical expectation of near equivalence.

The hypothesis examined in this research was the effect of substitute relationships on the difference between WTP and WTA values. Following Hanemann (1989), low levels of substitutability were expected to correspond with high difference values, while higher levels of substitutability were to correspond with low difference values.

The two CVM surveys showed no substantial evidence which supported the substitute hypothesis. In general, the possible substitute indicator variables were not found to be significant determinants of the WTA-WTP difference. With reference to the movie ticket valuations, our primary substitute indicating variable (whether or not a respondent had a VCR in their home), was not significant in difference regression estimates. Also, attitudinal questions on why respondents went to movie theaters were not generally significant in difference regressions. In the hunting survey, variables which were to indicate a respondent's dedication or intensity towards hunting were not significant in a consistent manner. Though there were some instances of significant relationships, there was inconsistency between the regression results of our two different "difference" measures in the hunting survey.

At this point, it is necessary to add some cautions in regards to the preceding general conclusion. Though we found no substantial evidence of the availability of substitutes affecting difference magnitudes, any conclusions are far from being equivocal. First, the task of deciding which variables might indicate relative substitutability is not an easy one. In the movie ticket valuations, choosing a substitute variable (VCR ownership) seemed fairly straightforward, as the survey was constructed with this purpose in mind. It is difficult, however, to tell how good a substitute watching a feature on a VCR is for watching the same feature at a theater. This problem is magnified in the hunting survey. In this case, the survey was not constructed to test this hypothesis. As a result, the relative substitutability was determined subjectively.

A second caution involves the CVM in a general sense. The accuracy of CVM welfare estimates is still not beyond doubt. There is probably a degree of measurement error in any CVM application (see Cummings et al. 1986). It is difficult to know how much statistical, strategic, hypothetical, or other "noise" is involved in the welfare measures generated from CVM surveys. Similarly, the results of the hunting survey difference regressions should be dealt with cautiously. The WTP and WTA measures are not truly comparable. Both of the computed per day WTA measures have certain weaknesses. Hence, the resulting difference measures potentially contain some additional measurement error.

Turning now to further research, several paths are suggested from this study. First, in relation to the movie ticket valuations, the fact that gender is significant is an interesting result. Unfortunately, the lack of female hunters in our survey, made further investigation of this result impossible. A second path for future research would involve the occurrence of substantial numbers of negative difference values (i.e. $WTP > WTA$). A response with a selling price less than their buying price is an unexpected result.

It has been said that "Economics as currently learned and taught in graduate school and practiced afterward is more theory-intensive and less observation-intensive than perhaps any other science" (Smith 1989, p.151). The research into the divergence between WTP and WTA does not follow this maxim. In fact, most studies in this area are empirical. This study adds to the collection of empirical results. Our results suggest that the WTP-WTA difference is not easily explained by traditional economic theory. Such a realization may have serious implications for economic analysis and policy, particularly environmental policy (Knetsch, 1990).

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Table 1: Descriptive Statistics

<u>Variable</u>	<u>Mean</u>	<u>St.Dev.</u>	<u>Min.</u>	<u>Max.</u>
Difference (WTA-WTP)	4.55	8.29	-3.00	50.00
WTP	4.76	3.30	.00	25.00
WTA	9.30	8.60	.00	50.00
TR. WTP*	4.72	2.88	.00	15.00
TR. WTA*	8.33	5.77	.00	25.00
TR. Difference*	3.60	5.07	.00	25.00
Extra income	1.91	1.36	1.00	6.00
Theater usage	1.96	.98	1.00	5.00
Feature	2.08	.96	1.00	5.00
Dates	2.83	1.03	1.00	5.00
Big screen	2.35	1.04	1.00	5.00
Rep. know.	1.61	.49	1.00	2.00
Rep. usage	1.04	.22	1.00	3.00
VCR own.	1.35	.48	1.00	2.00
VCR usage	2.46	1.23	1.00	5.00
Age (years)	1.82	1.00	1.00	6.00
Sex (female=2)	1.43	.50	1.00	2.00

N = 157

See text and Appendix I for variable definitions.

* denotes values after truncations of data due to removal of outliers and questionable responses; N=148

Table 2: Difference of Means Tests of WTP and WTA Measures

<u>Measure</u>	<u>Mean</u>	<u>Standard Error</u>	<u>T-value</u>
WTP	4.76 (3.30) ^a	.66374	6.84*
WTA	9.30 (8.60)		
WTP TR ^b	4.72 (2.88)	.51467	7.01*
WTA TR ^b	8.33 (5.77)		

* significantly different at the 1% level using a 2-tailed T-test

^a standard deviations are listed in parentheses.

^b responses to WTP and WTA truncated to remove outliers.

N=157 for WTP and WTA and N=148 for WTP TR and WTA TR.

Table 3: WTP-WTA Difference Regressions from the Movie Ticket Experiment

Dependent Variable	<u>Income</u>	<u>Gender</u>	<u>Big Screen</u>	<u>VCR Own</u>	<u>Constant</u>	<u>R-Sq.</u>
WTA-WTP	-.42855 (0.49)			.97603 (1.40)	4.7319 (1.40)*	.007
WTA-WTP	-.42710 (0.49)	2.9663 (1.33)*		.71169 (1.39)	3.2194 (1.53)	.038
WTA-WTP	-.46877 (0.48)	3.1381 (1.33)**	.80229 (0.64)	.70451 (1.39)	1.3206 (2.15)	.048
WTA-WTP(TR)	-.09800 (0.31)			.02088 (0.89)	3.771 (0.88)*	.007
WTA-WTP(TR)	-.09575 (0.89)	1.2488 (0.84)		-.08881 (0.89)	3.1612 (0.97)*	.016
WTA-WTP(TR)	-.15369 (0.87)	1.4376 (0.83)***	1.1123 (0.39)*	-.15773 (0.87)	0.59067 (1.31)	.067

Standard Errors in parentheses.

(TR) indicates sample truncation to remove outliers and questionable responses.

* indicates significant at the 1% level

** indicates significant at the 5% level

*** indicates significant at the 10% level.

N=157 for WTA-WTP and 148 for WTA-WTP(TR)

Table 4: Hunting Survey Descriptive Statistics

<u>Variable</u>	<u>Mean</u>	<u>SD</u>	<u>Min.</u>	<u>Max.</u>
Age (years)	33.407	10.227	15.00	66.00
Income	34552.846	11638.477	2500.00	50000.00
Hunting Experience (yrs)	15.561	9.480	1.00	48.00
Hunt Primarily for*:				
Meat	2.740	1.366	1.00	6.00
Trophy	3.081	1.377	1.00	6.00
Outdoor Experience	1.537	0.750	1.00	4.00
Companionship	3.675	1.198	1.00	6.00
Exercise	3.902	1.043	1.00	5.00
CAPCOST	440.970	1492.905	0.00	14050.00
AVGDIST	100.897	74.290	0.00	375.00
VEXP	690.537	638.551	0.00	6100.00
PERVEXP	0.022	0.022	0.00	0.34
TOTLIC	6.813	1.960	0.00	11.00
DIFF1 (AWTA-WTP)	81.441	215.121	-333.33	1200.00
DIFF2 (MWTa-WTP)	20.251	77.755	-391.20	229.585
WTP	72.691	75.078	0.00	1250.00
TWTA	1403.780	1567.980	0.00	8000.00
AWTA	154.132	227.177	0.00	1250.00
MWTA	92.942	32.514	34.10	250.213

Number of Observations = 123

* The five categories under "hunt primarily for" were ranked by the respondents from 1 to 6 with 1 being most important and 6 least important.

See text for variable definitions.

Table 5: DIFF1 (AWTA-WTP) Regressions from the Hunting Data

<u>Dependent</u>	<u>Totlic</u>	<u>Vexp</u>	<u>Meat^a</u>	<u>Const.</u>	<u>R-Sq.</u>
Diff	15.8486 (8.4457)***	-.03988 (.02286)***	30.7038 (11.6953)*	-74.1194 (64.5493)	.05571

<u>Dependent</u>	<u>lnTotlic</u>	<u>lnVexp</u>	<u>Meat^a</u>	<u>Const.</u>	<u>R-Sq.</u>
Diff	97.71748 (48.0680)**	-30.46624 (17.9921)***	31.82918 (11.7961)*	8.85777 (110.8874)	.05578

Standard errors are in parentheses

^a Hunt primarily for meat; 1 = most important, 6 = least important reason for hunting.

* significant at the 1% level

** significant at the 5% level

*** significant at the 10% level

N=123

Table 6: DIFF2 (MWTa-WTP) Regressions from the Hunting Data

<u>Dependent</u>	<u>Totlic</u>	<u>Vexp</u>	<u>Meat^a</u>	<u>Const.</u>	<u>R-Sq.</u>
Diff2	-.40657 (3.1154)	-.01221 (.00847)	4.8512 (4.2827)	23.9946 (24.0453)	.02148

<u>Dependent</u>	<u>lnTotlic</u>	<u>lnVexp</u>	<u>Meat^a</u>	<u>Const.</u>	<u>R-Sq.</u>
Diff2	14.9187 (17.7987)	-18.8116 (6.5427)*	5.5034 (4.2575)	99.2408 (40.3643)**	.05380

Standard errors in parentheses

^a Hunt primarily for meat; 1= most important, 6=least important reason for hunting.

* significant at the 1% level

** significant at the 5% level

*** significant at the 10% level

N=123

Appendix I: Movie Ticket Questionnaire

Consumer Preference Survey

1. How much money do you have left over per month to spend after all expenditures on necessities (ie rent, food, utility bills, transportation, tuition, textbooks, etc)?

\$0-100 ____ \$101-200 ____ \$201-300 ____ \$301-400 ____ \$401-500 ____ \$501+ ____

2. How many movies do you go to each month (on average)?

0-1 ____ 1-2 ____ 2-4 ____ 4-6 ____ 6+ ____

For questions 3-5, how do you react to the following statements? Check one of the following categories for each question.

(SA-strongly agree, A-agree, N-neutral, D-disagree, SD-strongly disagree)

3. "I go to a movie theatre primarily to see the feature that is currently playing and not just as a place to spend an evening out."

SA ____ A ____ N ____ D ____ SD ____

4. "I go to a movie theatre at least partly because it is a good place to go on dates."

SA ____ A ____ N ____ D ____ SD ____

5. "I go to movie theatre at least partly because I like to watch movies on big screens much more than on television."

SA ____ A ____ N ____ D ____ SD ____

6. Do you ever go to see movies at Repertory theatres like the Princess theatre? (ie showing primarily "second-run" movies)

Yes ____ No ____

7. How many times each month (on average) do you go to see movies at Repertory theatres?

0-1 ____ 1-2 ____ 2-4 ____ 4-6 ____ 6+ ____

8. Do you own (or does someone you live with own) a VCR?

Yes ____ No ____

9. How many movies each month (on average) do you watch on a VCR?

0-1 ____ 1-2 ____ 2-4 ____ 4-6 ____ 6+ ____

10. Age (please check one category)

16-20 ____ 21-25 ____ 26-30 ____ 31-35 ____ 36-40 ____ 41+ ____

11. Sex

M ____ F ____

12. Education (please mark the number of years you have completed)

Elementary/J.High/H.School: 1 2 3 4 5 6 7 8 9 10 11 12

University: 1 2 3 4 5 6 7 8 9

College: 1 2 3 4 5

Other: _____ 1 2 3 4 5

13. Faculty

Agricul/For _____ Arts _____ Business _____ Education _____
Engin. _____ Fine Arts _____ Grad Studies _____ Nursing _____
Phys Ed _____ Sciences _____ Other (please specify) _____

Endnotes

- 1 A number of functional forms and specifications were estimated. The results presented are representative of the results of the forms estimated.
- 2 In this paper semi-log indicates a transformation of the independent variables into natural logarithms.
- 3 The "bid function" was estimated using a double-log functional form. The results of the bid function estimation are:

<u>Dependent</u>	<u>lnIncome</u>	<u>lnDays</u>	<u>Const.</u>	<u>R-Sq.</u>
lnTWTa	.31127 (.18163)* **	.53477 (.11923) *	2.31312 (1.87074)	.10864

*significant at the 1% level, ***significant at the 10% level, N=123

The bid function takes the form

$$\ln(TWTA) = \alpha + \beta(\ln Days) + \gamma(\ln Inc)$$

where "TWTA" is the WTA for giving up hunting for one year, "Days" is the total number of days spent hunting in the previous year, "Inc" the total household income, and α , β , and γ are coefficients. The derivative of "TWTA" with respect to "Days" yields a value for marginal WTA of a day of hunting. This value is a conditional median value of marginal WTA. The measure was further modified to obtain a minimum variance, unbiased estimate of marginal WTA, following Goldberger (1968).

- 4 The t-statistics for the difference of means test are 4.03 for MWTa versus WTP and 5.86 for AWTA versus WTP.
- 5 In attempting to get additional information regarding the WTA-WTP difference, a number of other regressions were estimated. First, the results were truncated in an attempt to eliminate outliers. Second, because of the high number of negative difference values in the hunting sample, further regressions were estimated using positive difference values, and then negative difference values as the dependent variable. In general, the results of truncated difference regressions provided fewer significant relationships. The only exception to this trend was the regression for positive difference values. In the DIFF1 form of this regression, hunting-related expenditures ("VEXP") and hunting for meat ("Meat") are significant at the 5% level. The Positive DIFF2 regression estimates included significant coefficients for "TOTLIC" (1% level) and "VEXP" (10% level).



